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A comparison of music performance anxiety to a laboratory stressor

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This study extends previous work investigating the cardiovascular reactivity to stress obtained in response to laboratory-based tasks to cardiovascular reactivity measured in response to a musical performance. Heart rate (HR) reactivity and psychological responses were measured in 52 female and 18 male healthy classically trained graduate students in two settings: during a standardized laboratory stressor (Stroop) and prior to a jury assessed musical performance of two pieces. HR and state anxiety (SAI) were assessed. Results indicate that while both conditions increased HR significantly, there was no difference in the magnitude of change in response to the musical performance and the laboratory stressors. However, the musical performance produced significantly higher levels of perceived anxiety between conditions. A greater correlation was observed for HR in between conditions compared with the relationship observed in the SAI responses. Some support is provided for the view that the Stroop could be used to identify higher HR responders to musical performance, although its efficacy to self perceptions of anxiety are less compelling.

Keywords: performance; stress; cardiovascular; laboratory; prediction

Musicians experience anxiety as part of an occupational hazard, and to some extent this, can facilitate the quality of performance to which they aspire (Valentine *et al.* 1995). However, it is recognized that prolonged anxiety and stress can lead to psychological and physiological adjustments that may be detrimental to health. For example, excessive psychological stress is associated with lifestyle behaviors such as smoking and excessive alcohol consumption (Kreutz *et al.* 2009), while other, less injurious stress coping

methods exist (Hull *et al.* 1984). Immediate and long-term effects of stress include altered hormonal and cardiovascular status that over time are linked with increased risk of hypertension, diabetes, and a range of other chronic conditions (Cohen *et al.* 2007, Wiebner *et al.* 1996, Wiebe and McCallum 1986).

Research into stress response predominantly utilizes laboratory tasks that, while standardized, lack relevance to the everyday experience of the individual, and there is also some difference in responses across stressors (Mason 1975). Some studies have used more applied stressors, for example Abel and Larkin (1991) investigated the cardiovascular response of musicians to two laboratory tests and a jury performance, although the study lacked psychological measures. This study had two aims, firstly to compare the psychological and cardiovascular response of musicians prior to an assessed performance and a common laboratory stressor—the Stroop Word Colour conflict test (SWC)—and secondly to identify whether the SWC could be used to identify high responders prior to the musical performance.

METHOD

Participants

Seventy classical musicians (52 female, mean age=22±2.96 years; 18 male, mean age=21±1.94 years) representing a wide range of instrument types with an average of 12 years experience took part in the study.

Materials

State anxiety was assessed using the short version (10 items) of the original 20-item State Anxiety Inventory (SAI; Spielberger *et al.* 1983) due its suitability for repeat-measures. The SAI is a widely used assessment tool of state anxiety and has acceptable reliability and predictive validity (Barnes *et al.* 2002) and has been used widely in this area (e.g. Knyazev *et al.* 2002, Raikkonen *et al.* 1999).

The Stroop Word Color conflict test (SWC) "is a widely known and robust measure of selective attention and interference" (Atkinson *et al.* 2003, p. 1) and is commonly used to illicit cardiovascular challenge (Hamer *et al.* 2005). The task involves the use of a sequence of slides shown on a computer screen at a rate of one slide per second. Each slide contains a word describing a color written in an alternative color termed the incongruent condition. The process of word impacting the processing of color is the so-called "Stroop effect." Participants responded verbally with the color in which the word is written

and errors are recorded. There are 11 color nouns colored in 10 different colors in this test, of which some were chosen specifically because they were ambiguous.

Procedure

Participants completed two assessments: an assessed, two piece musical performance of about 10 minutes and a 3-minute Stroop word-color conflict test on separate occasions at the same time of day one week apart. Heart rate (HR) was assessed at baseline after 15 minutes rest, during 3 minutes pre-musical performance (PMP) after 15 minutes rest, and during the 3-minute Stroop. State anxiety was assessed pre- and post-Stroop and pre-performance. All data met the criteria for conducting parametric statistics.

RESULTS

The data showed that HR was significantly elevated from rest (M=74±11.31 beats per minute [bpm]) to PMP (M=85±11.26 bpm, t_{69}=8.83, p<0.001) and during SWC (M=83±11.73 bpm, t_{69}=8.91, p<0.001). The spread of data was consistent across the three data points. Repeat measures t-test revealed no significant difference between PMP HR and SWC HR responses. The HR PMP was significantly correlated with SWC HR (r=0.50, p<0.001, R^2=0.25).

SAI was significantly elevated PMP (M=21.51±5.21; t_{69}=10.18, p<0.001) and post-SWC (M=18.66±4.97; t_{69}=7.12, p<0.001) compared with rest (M=14.91±4.55) The SAI PMP was significantly greater than the SAI response to the SWC (t_{69}=4.19, p<0.001). The SAI PMP was significantly correlated with SAI SWC (r=0.37, p<0.01, R^2=0.14).

No differences were observed between genders for HR PMP and during SWC or for SAI values. There was a trend for female musicians to have higher SAI PMP than males (p=0.051).

DISCUSSION

This study demonstrates increased cardiovascular responses to musical performance, which concurs with the findings of Abel and Larkin (1991), and increased anxiety above baseline, in agreement with LeBlanc *et al.* (1997). The SWC also produced increased cardiovascular and anxiety as previously demonstrated (Hamer *et al.* 2005). The results show that a 3-minute laboratory stressor elicits a similar magnitude of HR response to those observed pre-musical performance. This is in contrast to Davig *et al.* (2000) who showed that HR responses to a “natural stressor” was more elevated than a

battery of laboratory stressors. These data also showed that HR between conditions had a shared variance of 25% indicating some, although not strong, predictive power. Kamarck *et al.* (2000) demonstrated similar results with those who showed larger responses to laboratory stressors, demonstrating greater HR responses to classroom speeches. The absence of differences between men and women is in contrast to van Doornen (1987), but it is recognized that the sample is heavily weighted toward female participants (52 versus 18). Hence, care is required when interpreting this absence of difference.

In contrast to the cardiovascular response, while SAI also increased in both conditions above baseline, musical performance produced a significantly greater SAI response than the Stroop test. One explanation for this may be the greater psychological engagement in the task and salience of the performance against the more abstract task. Dickerson and Kemeny (2004) report that stressors characterized by social-evaluative threat demonstrate greater cortisol responses. There appears to be no previous comparison of SAI between the Stroop Word Color test and music performance anxiety.

This work suggests that the Stroop Word Color test could be useful in identifying high music performance anxiety cardiovascular responders, but not high self-perceived music performance anxiety.

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